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I, LEANNE MYNOTT, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ4900 for a patent by CENTROGEN HOLDINGS PTY LTD filed on 24 December 1999.

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10/070223

WITNESS my hand this
Sixth day of September 2000

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P/00/009
Regulation 3.2

CENTROGEN HOLDINGS PTY LTD

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

"THERMOPLASTICS PRODUCTS WITH EXPOSED POROUS COMPONENTS AND METHOD OF FORMING SAME"

This invention is described in the following statement:

THERMOPLASTICS PRODUCTS WITH EXPOSED POROUS COMPONENTS AND METHOD OF FORMING SAME

THIS INVENTION relates to thermoplastics products with exposed porous components and a method of forming same. The invention has particular application to a rotor for a liquid chemical applicator with rope wicks for applying weedicides to crops and the like, such as that described in our co-pending Australian Provisional Patent Application No. PQ3341. However, it is believed that the invention has general application to the moulding of other articles incorporating a thermoplastics material and a rope or other porous material, but leaving at least part of the rope exposed.

When a device requires a component made from porous material to be fixedly supported, but exposed for use, clamps, glands, grommets, ties, crimps, or such like are often employed, particularly where the support for the porous material is a thermoplastics material. In applications where the wicking properties of the porous material are utilised, such as in the applicator described in the abovementioned provisional application, clamps or ties may be made from metal for strength, but are prone to corrosion. If made from plastics material, such clamps or ties are often not strong enough to hold the porous material against being removed from the support. Crimps or barbs may be used to retain the porous material in place, but may damage the porous material. The porous material is also prone to being torn loose from the crimps or barbs. Additionally, in applications where wicking properties of the porous material are utilised, the flow rate of liquid through the porous material is sometimes difficult to control, or requires the use of extra

devices associated either with the supply of liquid to the wick or wick itself. Moreover, the cost of assembly of the various components is undesirably high.

It is an object of the present invention to provide thermoplastics products with exposed porous components. It is another object to provide a method of forming thermoplastics products with exposed porous components. It is another object to provide a cost effective method of controlling rate of liquid flow through a porous material. Other objects and advantages of the invention may become apparent from the following description.

With the foregoing in view, this invention in one aspect resides broadly in a method of forming a thermoplastics product with an exposed porous component including the steps of:

providing a component formed from a porous material;

supporting at least some of the porous material in a mould;

compressing a portion of the porous material supported in the mould;

injecting a thermoplastics material substantially about the compressed portion of the porous material; and

releasing the thermoplastics material and the porous material from the mould after the thermoplastics material has set.

Preferably, the compression step is achieved by introducing a ram or pusher into the mould and engaging the ram with the portion of the porous material to be compressed prior to the introduction of the thermoplastics material, and then injecting the thermoplastics material while the portion of porous material is compressed, and then removing the ram prior to the setting of the thermoplastics material, whereby the thermoplastics material

back-fills the space previously taken up by the ram as it is withdrawn prior to solidification of the thermoplastics material.

Preferably, the characteristics of the materials and the parameters of the moulding process, particularly the temperature and injecting pressure, are selected such that some of the thermoplastics material penetrates at least part-way into the porous material in the moulding step. It is also preferred that the components be arranged such that the compressed portion will be encircled by the thermoplastics material. If desired, the thermoplastics material may also be moulded around or into some of the uncompressed portions of the porous material. For example, the method of the present invention may be used to mould a thermoplastics rotor disk about one or more a rope wicks. In the process, the rope is preferably cut with a hot blade to prevent fraying, and the cut end is pressed into a V-shape, and the rope is preferably secured into a channel in the mould to prevent the rope sliding along the channel with the flow of the plastics material, while a length of rope passes out of the channel to provide a free end.

The other end of the rope is preferably compressed and a portion (the restriction portion) of the rope intermediate the ends, but near to the free end, is also compressed, this being the position of a central recess described later in this specification. The compressed end is completely encapsulated and the restriction portion is completely encircled, while the portion in the channel is partially embedded in the thermoplastics material. One or more supporting bands may be moulded around the portion in the channel. The amount of compression of the restriction portion can be varied to adjust

the required flow rate of liquid along the wick and the injecting pressure of the termoplastics material can also be varied for this purpose.

After the thermoplastics material is sufficiently rigid, the mould is opened, the part ejected, and allowed to cool before further processing. The encapsulated end is preferable completely surrounded to prevent liquid from wicking from the end of the rope when in use.

In another aspect, the invention resides broadly in a thermoplastics product with one or more exposed porous components by the method herein described.

In another aspect, the invention resides broadly in a method of constructing a rotor head for a motor driven applicator of the type having a first part moulded of a plastics material and being disk-like in form with a central recess formed therein and a plurality of applicator wicks extending through a wall of said recess towards the periphery of the first part and having a portion thereof within the recess including:

cutting a piece of wick rope to a desired length to extend across a face of the first part;

compressing a portion of the wick rope to greater in length than the thickness of the recess wall, and moulding the recess wall about the compressed portion of the wick rope while it is compressed, and

allowing the plastics material to set before releasing the wick rope. It will be appreciated that the method may be carried out for a plurality of wick ropes extending through the recess wall.

The degree of compression of the wick rope is preferably

selected to provide a throttling effect on flow of liquid through the compressed portion, thereby providing a controlled flow of liquid through the wick ropes from the recess to the extended portions of the wick ropes. It is also preferred that the extended portions of the wick ropes be compressed also, but to a lesser degree than the compressed portions, and that the plastics material be moulded at sufficient pressure to penetrate part-way into the porous material of the wick ropes whereby the plastics material when set is keyed into the wick ropes to hold them securely against the first part of the disk-like rotor head.

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention, and wherein:

Fig. 1 is a plan view of a segment for a plastic rotor disk with a rope wick moulded in place;

Fig. 2 is a section through line 2-2 of the segment of the rotor disk of Fig. 1;

Fig. 3 is a diagrammatic sectional view showing the rope wick, die and plastic flow within the die;

Fig. 4 is a diagrammatic sectional view of the rope wick of Fig. 3 showing a ram or pusher for compressing the rope;

Fig. 5 is a diagrammatic sectional view of the encapsulated end of the rope.

Referring to Fig. 1. the rotor disk segment 10 includes a disk body 11 and a rope 12 used as a wick for the delivery of liquid chemical, such as weedicide or such like, the segment being shown from the upper side and the rope being shown in dotted outline extending in a radial direction along part of the

underside of the disk body. Referring to Fig. 2 in association with Fig. 1, the wedge-like end of the disk portion is shaped to form a central recess, the recess being circular when 12 of the segments are placed in side by side relationship to form a complete circular rotor disk.

A recess wall 16 divides the recess from an outer portion 17 of the segment, the outer segment being strengthened by two radially extending ribs 21 extending outwardly from the reservoir wall along the top surface of the outer portion of the segment.

The rope is embedded in a channel which extends along the underside of the outer portion from the recess wall to the circumferential periphery 19. The circumferential periphery includes an outer wall portion.

The die used to form the segment 10 is a hardened steel dye with the following features. A thick outer rim is provided at 101 to provide strength and moulding stability. The rope is pinched at 102 to secure the end of the rope to the outer circumference and lock it into position. At 103 it will be seen that the ribs have large radii to maximise strength and fatigue resistance in the finished segment. The ribs also provide a flow path during the moulding process for the thermoplastic material to flow out to the thick outer rim. A sloped seamline is provided along the welding track at 104 between abutting segments to provide optimum welding conditions to minimise leaks and maintain consistent strength of the rotor disk when completed. Two retaining spikes are providing in the channel at 105 to keep the rope in position during the plastic injection process. A mobile pusher platform is provided at 106 to locate the pusher to positively locate the rope into the relevant channel. This platform is withdrawn at a

precise moment after the plastic has been introduced into the mould. A rope backing at 107 provides elevated support to the rope without restricting the flow of chemical through the rope. It also provides a flow channel for thermoplastic material as it flows out to the disk outer rim during the moulding process. At 108, there are respective locating features, a protrusion of one side and a recess on the other side, for easy assembly and increased strength by positively locating the successive segments in there abutting relationship.

Referring to Fig. 3, a portion of the dye is shown at 31 with the rope in position, and the flow of the plastic material is shown by respective arrows 33. Referring to Fig. 4, the pusher 36 pushes the rope and deflects it to hold it in position. Referring to Fig. 5, the outer end of the rope shown at 14 is cut to a wedge shape with a hot knife to prevent fraying, and an outer pusher 37 is used to compress the outer end of the rope into the thick outer rim 101. With reference to Fig. 2, the rope is pinched at the outer periphery at an outer compression point 25 and also at an inner compression point 26 in substantial alignment with the recess wall 16.

The rope is first cut to length using a hot knife to prevent fraying. While the cut end is still molten, it is formed into a V-shaped tip to enable proper rope placement during the die closure. The dye closure is pushed all the way into the die cavity, and the rope is placed manually into a location channel by the operator of the die. The V-tip end is placed 2 mm above the outer pusher 37. The die is closed and the V-tip allows the end to slide into its channel on the other side of the dye. The plastic is injected and flows past the V-tip of the rope end.

Because this V-tip is securely located at the bottom of the dye, the plastic does not dislodge the rope from the channel. The plastic compresses the rope along its length. If the rope end is not secure in the channel, it would be pushed along the channel and end up bunched up and deformed. Part way into the injection cycle, the pusher is withdrawn and this allows plastic to backfill the exposed rope left by the withdrawal of the pusher. The die is cooled to cause the plastic to attain sufficient rigidity, then the die is opened and the parts ejected and allowed to cool for at least 5 minutes before they are further worked on.

It will be appreciated that the rotor disk may also be moulded in one piece with twelve ropes extending radially from the central recess using the method of the present invention.

While the above has been given by way of illustrative example of the present invention, all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the present invention as herein set forth.

Dated this 24th day of December, 1999

CENTROGEN HOLDINGS PTY LTD

By its Patent Attorneys

AHEARNS

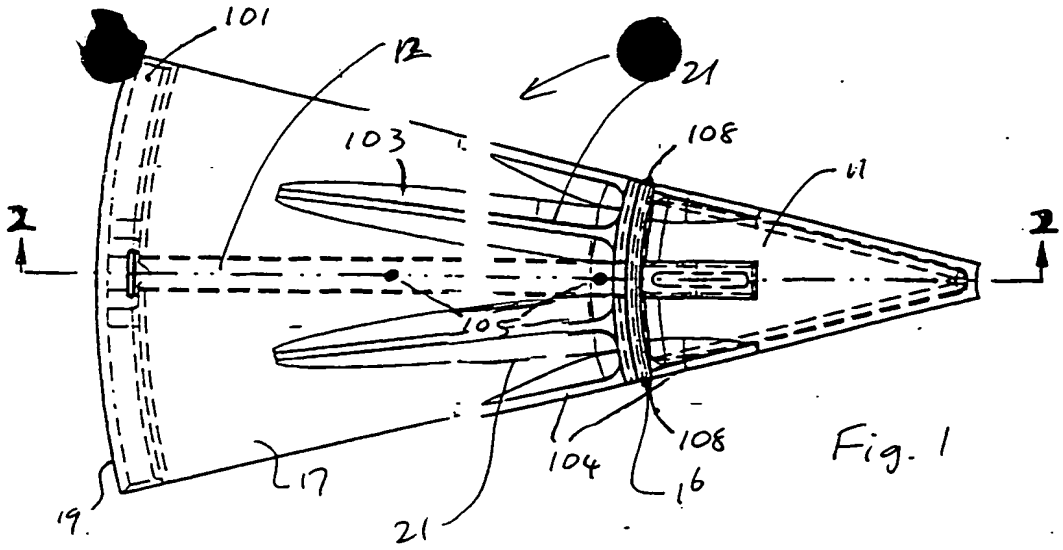


Fig. 1

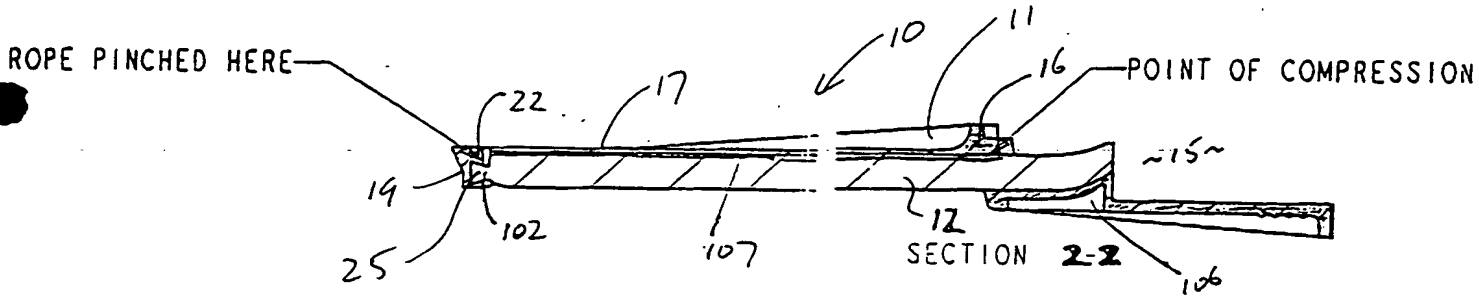
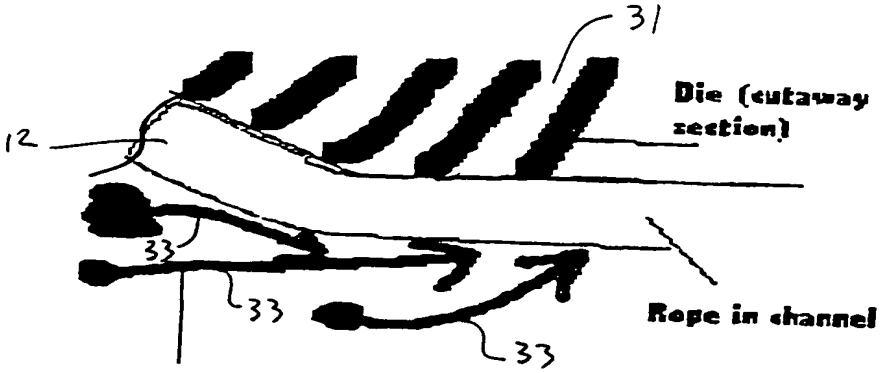


Fig. 2



Plastic Traveling into die

Fig. 3

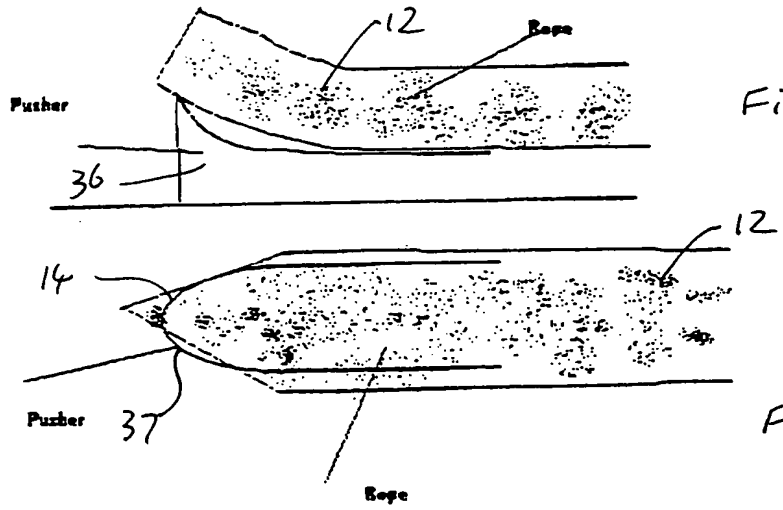


Fig. 4

Fig. 5